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Streamside Management

A Decision-Making Procedure for South Coastal British Columbia

REVISED 2ND EDITION

LAND MANAGEMENT
HANDBOOK
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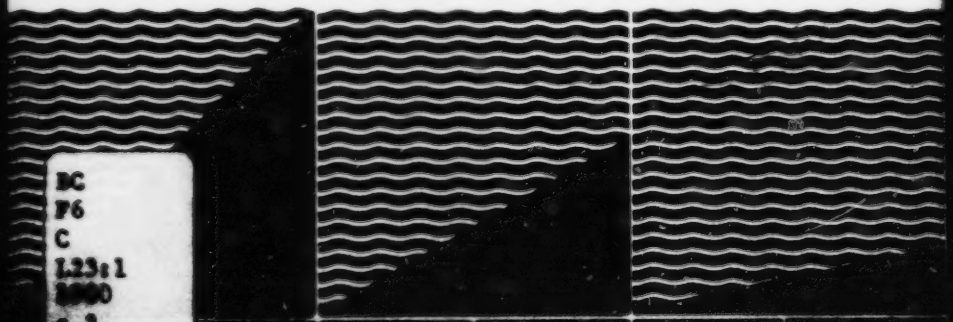

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Streamside Management
A Decision-Making Procedure for South Coastal British Columbia

by
M. Keith Moore
Revisions by
G. C. Archdekin

Sponsored by
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and the Vancouver
Forest Region

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The contents of this booklet are the responsibility of the author and reviser but without the participation of many people in the organizations listed above, the project could not have been undertaken. Sincere thanks to all of them.

The second edition was produced with the assistance of a large proportion of the people mentioned above. In addition thanks must be given to Mike Massie, Nawitka Renewable Resource Consultants Ltd., for his assistance with the economic analysis; and to Kathy Villalobos for the typing. Tim Mock, Research Branch, Ministry of Forests was most helpful in preparing the handbook for publication. Alston Graphics did the typesetting and layout.

Keith Moore must be thanked for his contribution to furthering streamside management in British Columbia and for providing a large part of the material and background information for the second edition. It is afterall, a revision of his original booklet.

Introduction

This booklet is a site specific guide to the management of streamsides on Vancouver Island and South Coastal British Columbia for which logging is proposed. It should be considered an aid for field level personnel to determine what logging practices should be used and how much vegetation, if any, should be left along streamsides to provide for the requirements of non-timber users. The procedure deals with the maintenance of fisheries, wildlife, recreational, aesthetic, and water quality values while harvesting timber. It does not deal with stream rehabilitation or stream improvement projects, nor does it consider the trade-offs between resource values. However, it does provide information which may help to make those trade-offs.

The procedure is designed for use before cutting boundaries and roads are located. It is intended that an on-site assessment of streamside cutblocks and determination of an appropriate management strategy will be completed before a cutting permit application is made.

Use of the procedure will allow for more streamside decisions to be made at the field level and will reduce the need for time-consuming joint field inspections. However, it may not deal adequately with highly sensitive sites from a wildlife, fisheries or slope stability point of view and will not eliminate the need for, or the value of, joint field inspections on those sites. Examples of these sites are provided on page 71. The on-site checklists and the decision-making procedure may still be used on these sites and can provide a basis for their assessment. They also provide a method for communicating information about these sites and the proposed management strategies. Representatives of appropriate government agencies should be contacted about these sites and a joint field inspection considered.

The booklet is useful only if the streamside timber is being considered for logging. If the timber is not scheduled for harvest or non-commercial, a streamside management decision does not need to be made at this time. The procedure also may not deal adequately with sites deferred at an earlier planning stage and joint field inspections should be considered for these sites too.

It should be kept in mind that numbers used within this booklet are aids only, not rigid rules, and some of the evaluations are based on a consensus of professional opinion rather than specific research findings.

The booklet has been developed following fieldwork in many areas on Vancouver Island. An early draft was reviewed and revised by an inter-agency and industry working group and a second draft was field tested by Ministry of Forests, Fish and Wildlife, Federal Fisheries and industrial personnel in seven Ranger Districts on Vancouver Island. Based on those field tests and subsequent field work and revisions the 1978 edition was produced. The latest evaluation involving the same agencies prompted this revised second edition in handbook form. It should not however, be considered the final answer to the complex problems involved in streamside management. Further evaluations and revision will be required as the procedure is used in different areas, as new information becomes available and as new logging techniques come into practice. It is recognized that continual review and revision are integral parts of a decision-making procedure.

A glossary of terms used in the booklet is included on page 84-87.

This, the second edition of the booklet, is the result of one year of evaluation and review of the previous edition.

Following publication of the first edition, the Ministry of Forests conducted an analysis of the Streamside handbook throughout much of the Vancouver Forest Region. The analysis, based on field testing, included input from the different agencies involved both individually and in group field tests. However, the testing did not include any monitoring of implemented strategies. Future emphasis can be directed at establishing a cooperative program of implementation and monitoring involving the agencies directly concerned with streamside management. Such a program would provide for updating of the handbook as necessary.

Although the Forest Service field staff were shown how to use the cards (see page 28) and the handbook, it became clear that a short course on the use of the handbook procedure is needed. A slide presentation with all the different stream and streamside characteristics shown, and repeated use of the procedure would make all persons using the handbook, facile with it.

The new format is intended to facilitate carrying the handbook in a vest or truck; however, the checklist cards are all that are necessary for the field inspections once the user is familiar with the system. This format is also intended to improve the durability of the handbook.

Important Terms

A **Stream** is any watercourse which has a flow of water for all or part of the year and which has a defined channel showing signs of scouring or washing. It may be very large or very small, perennial or intermittent. For the purposes of this booklet, the definition of a stream does not include ephemeral flows of water which occur after precipitation or snowmelt and which do not flow long enough or at large enough volumes to create stream channels. A **low gradient stream** has an average gradient of less than 20%. A **steep gradient stream** is one with an average gradient of 20% or greater.

The **streamside** is considered to be the land, and the vegetation it supports, immediately in contact with the stream or sufficiently close to it to have a major influence on, or be influenced by, its ecological character. It has both a mix of uses ranging from timber production to wildlife habitat and visual enjoyment, and a complex biophysical character with attendant attributes and limitations.

The **streambank** is the rising ground bordering a stream channel below the level of rooted vegetation and above the normal streambed.

The **users** of the streamside potentially include the forest industry, anadromous and resident fish (on-site and downstream), deer, Roosevelt elk and other wildlife, birds, active recreationists, viewers, downstream recreationists and residents using the stream water. They use the streamside as habitat, as protection for habitat or as a source of valuable goods or services. Some or all of these users may be found on any given streamside.

Streamside management means the application of forest practices and technologies that are consistent with the physical constraints of the site and that provide as far as possible for the management needs of the users. Streamside management may include a number of practices ranging from logging across a small headwater stream to leaving a wide strip of timber along a large river. It may also include a number of special falling and yarding techniques such as cable assist falling and a number of remedial measures such as debris clearances.

This booklet is designed to aid field personnel in making streamside management decisions.

How To Use This Booklet

Two simple decision-making procedures are contained in the booklet. One procedure is used for small, steep headwater streams with gradients of 20% or greater and no onsite users; the other is applicable to all other streams. Both procedures involve an on-site inspection of the streamside proposed for logging, completion of a Streamside Checklist and use of the keys presented in this booklet to identify which of a range of streamside management strategies is most appropriate to the specific streamside cutblock. To use the booklet, follow the decision-making procedure for steep gradient streams or the procedure for low gradient streams to identify one of the Streamside Management Strategies illustrated on pages 63 to 79.

Steep Gradient Stream Procedure (pages 11 to 21)

(used for streams with gradients of 20% or greater with no onsite users)

The steep gradient stream procedure considers only the impact of streamside logging on downstream water users. The first step is to complete the Streamside Checklist in the field using the notes on page 15. Using the information from this Checklist, the Value of the Streamside for maintaining downstream water quality is assessed as Low, Moderate or High. On the basis of this value an initial Streamside Management Strategy is chosen. If there is any question of the presence of on site users then the low gradient stream procedure should be used.

Low Gradient Stream Procedure (pages 23 to 62)

(used for streams with gradients of less than 20%.)

The low gradient stream procedure evaluates the impact of streamside logging on several resources, including fish, Roosevelt elk, recreation, aesthetics and water quality. It also involves completion of a Streamside Checklist in the field and it is recommended that a review of available information be made before completion of the Checklist. The Review and the Streamside Checklist, and notes for their completion, are on pages 30 to 34. Next, using the information collected, specific Users of the Streamside are identified. For each of these Users, the Value of the Streamside is assessed, on pages 36 to 49 as Low, Moderate or High. An initial choice of an appropriate strategy is then made. A strategy based on the streamside value should be chosen for each identified user and the highest indicated strategy is the initial appropriate Streamside Management Strategy.

The Streamside Management Strategies are chosen after an assessment of the environmental needs of the Users of the Streamside. They provide for retaining as much vegetation as appears to be necessary to maintain existing resource values. However, numerous other factors, or trade-offs, may also enter the decision and these are presented on page 80 as Strategy Modification Factors. An assessment of the probability of blowdown in a leave strip is included. After considering these Strategy Modification Factors, a final strategy choice can be made and the decision implemented.

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STEEP

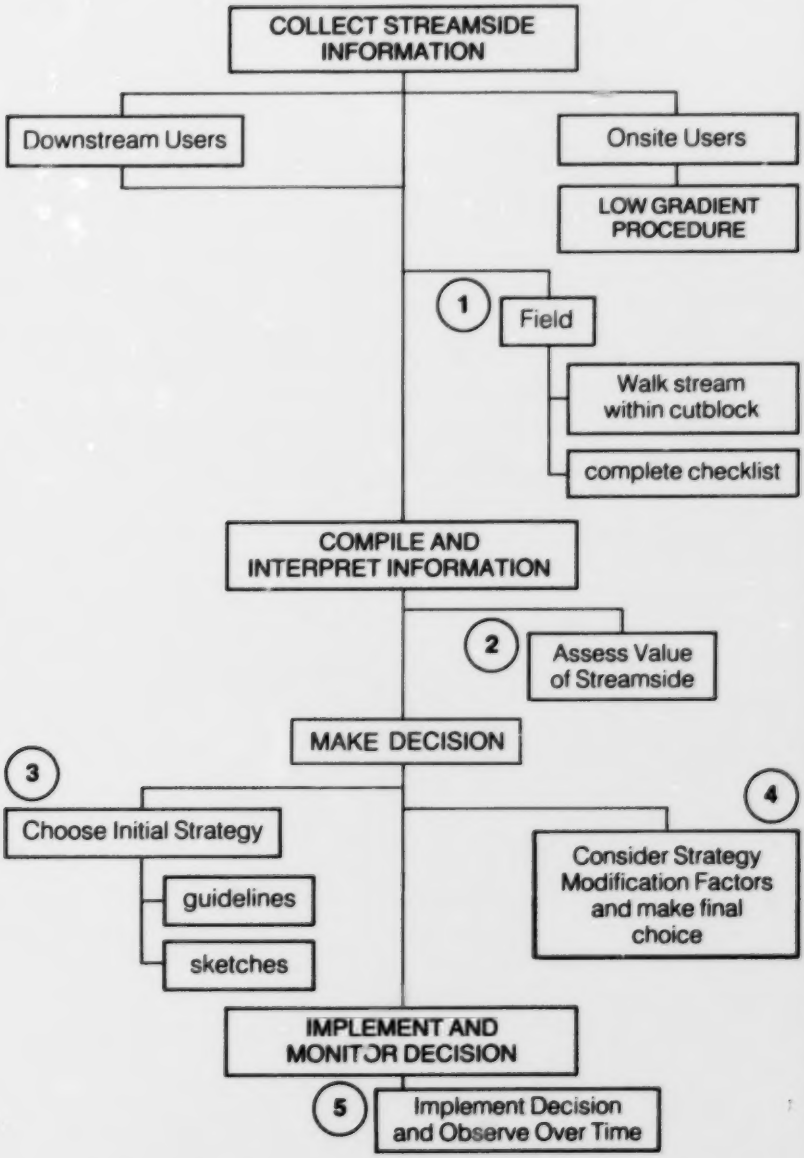
DECISION-MAKING PROCEDURE FOR STEEP GRADIENT STREAMS

This procedure should be used for steep, headwater streams with average gradients of 20% or greater. The impact of logging the streamside on downstream water quality is the only factor considered.

If the on-site inspection reveals that the average gradient is less than 20% or that users are present on-site or that the stream is quite large, the procedure for low gradient streams should be used.

For Low Gradient Procedure see page 23.

Steep Gradient Procedure
FLOWCHART



Walk a representative length of the streamside within the proposed cutblock and complete the Streamside Checklist.

This Checklist, which is reproduced in field card size, should be completed on-site. It is the only part of the procedure that need be taken into the field. When completed, it is used in conjunction with this booklet to determine the appropriate streamside management strategy.

Notes for the completion of this Checklist are included.

Streamside Checklist (steep gradient streams)

1. Stream Name .....
2. Block Identification .....
3. General Location .....
4. Block Location .....

5. Gradient (%)	<20		20+
6. Rooted Width (m)	<3	3-10	>10
7. Slope Percentage (%)	<20	20-70	>70
% Distribution			
8. Length of Slope (m)	<20	20-60	>60
9. Debris Jamming		Yes	No
10. Large Anchored Debris		Yes	No
11. Large Moving Debris		Yes	No
12. Stable Channel		Yes	No
13. On-site Fish or Recreation		Yes	No

14 Downstream Use .....

15 Distance to Downstream Users .....

16 Sensitive Areas

- Unstable Streambanks
- Evident Slumps
- Bank Scouring
- Numerous Streams
- Gully Patterns
- Other

17 Comments

Notes For Streamside Checklist

(steep gradient streams)

1. **Stream Name**
   Give gazetted name, local name or made up name for identification. If unnamed identify by #2.

2. **Block Identification**
   Give TFL, FL, TSHL, TSL or other number, CP number and cutblock identification number.

3. **General Location**
   Give general location of stream e.g. tributary to, or flows into, or map reference.

4. **Block Location**
   Give position of block on stream e.g. west side, or both sides, and give road access.

5. **Gradient**
   Using a clinometer determine whether average gradient of stream is less than 20%, or 20% and greater and indicate. Circle one value.

6. **Rooted Width**
   Circle one value as representative of stream average width. Rooted width is the width of the stream channel between rooted vegetation on either bank.

7. **Slope**
   Indicate percentage distribution of slopes of the streamside between the vegetation adjacent to the stream and the topographic break (if there is one) e.g. 20% less than 20% slope, 40% 20-70%, 40% greater than 70%.

8. **Length of Slope**
   If sloping indicate the length of slope to the topographic break. Circle one value.

9. **Debris Jams**
   Circle YES if present. Debris jams are accumulations of debris which impede the normal flow of water and serve as a catch for moving debris.

10. Large Anchored Debris

Circle YES if present. Large anchored debris is logs or log chunks anchored in place in, or above, the stream and often covered with mosses or algae but not impeding the normal flow of water or acting to catch moving large debris.

11. Large Moving Debris

Circle YES if present. Large moving debris is logs or log chunks not anchored in place and not covered with mosses or algae, which will move downstream during periods of high water.

12. Stable Channel

Circle YES if stream is well-defined with no evidence of channel shifting.

13. On-Site Fish or Recreation

Circle YES if there is any evidence on-site of fish in the stream or recreational use of the streamside.

14. Downstream Use

Circle YES if there are fish, recreationists or domestic water users downstream in the stream system.

15. Distance to Downstream Users

If downstream users are present indicate the distance downstream. If no downstream users are present, leave blank.

16. Sensitive Areas

If any of the following conditions are present on the site, they should be noted and guidance sought from Federal Fisheries or Fish and Wildlife Branch officers — unstable streambanks,clearly evident and significant slumps, bank scouring indicating extremely high flows of water or debris torrents, numerous streams within the block, numerous dry, sharply incised gullies along the streamside or any other feature indicating that the stream may require special treatment.

17. Comments

Add any comments pertaining to the stream or streamside which may affect the choice of a management strategy. Make note of timber values, deflection, falling or yarding constraints. Refer to any sensitive sites identified in #16 or to other considerations.

Assess the Value of the Streamside to Downstream Users

If SENSITIVE SITES are noted (Checklist #16) Initial Choice of strategy is ..... A4 or B4 (page 70 or 78)

If no DOWNSTREAM USERS are present, streamside value is .....Low

If DOWNSTREAM USERS are present, consider the value of the streamside vegetation for:

(a) preventing the downstream movement of logging debris (page 18); and

(b) stabilizing the stream channel and sloping streamside (page 18)

Then Consider:

(c) The overall streamside value (page 19).

(a) Debris Buffering

CONSIDERATION	EVALUATION	BUFFERING VALUE*
1. Size of stream and channel stability	If rooted width of stream is less than 3 metres (10 ft.) with large anchored debris and a stable channel, consider 2.	
	If rooted width of stream is greater than 3 metres (10 ft.) or if there is evidence of large moving debris, debris jams, sluice-outs or bank scouring, consider 3.	
2. Proximity to downstream users	If close to or immediately tributary to downstream users.	Moderate
	If not immediately tributary to or distant from downstream users.	Low
3. Slope of streamside	If slope of streamside is predominantly less than 20%**	Moderate
	If slope of streamside is predominantly greater than 20%**	High

(b) Channel and Streamside Stability

CONSIDERATION	EVALUATION	STABILIZING VALUE***
1. Size of stream and channel stability	If rooted width of stream is less than 3 metres (10 ft.) with large anchored debris and stable channel, consider 3.	
	If rooted width of stream is greater than 3 metres (10 ft.) or if there is evidence of large moving debris, debris jams or unstable channel, consider 2.	
2. Slope of streamside	If slope of streamside is predominantly less than 70%** consider 3.	
	If slope of streamside is predominantly greater than 70%**	High
3. Proximity to downstream users	If immediately tributary to or close to downstream users	Moderate
	If not immediately tributary to or distant from downstream users.	Low

(c) Overall Streamside Value

The value for each of the following functions:

(a) Debris Buffering

(b) Channel and Streamside Stability

has been considered.

Make initial choice of strategy on page 20.

If one or both values are High, the overall streamside value is High.

If neither value is High but one or both is Moderate, the overall streamside value is Moderate.

If both values are Low, the overall streamside value is Low.

* *Refers to the value of the standing streamside vegetation for preventing logging debris from entering the stream. If the streamside trees were removed some logging debris could enter the stream directly from falling or from downslope movement of debris.*

** *If the slope of the streamside is variable as indicated by the Streamside Checklist, more than one slope class may be used and different buffering values obtained. Different management strategies may be used to reflect this variation in slope.*

*** *Refers to the value of the streamside vegetation for maintaining channel and streamside stability.*

STEP 3

Make initial choice of Streamside Management Strategy

DOWNSTREAM USER (steep gradient streams)

STREAMSIDE VALUE Low

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently.

No special precautions to protect streamside vegetation are required.

No special falling or yarding techniques or remedial measures are necessary.

SPECIFIC CONSIDERATIONS	INITIAL STRATEGY
If both sides proposed for logging	A1a
If only one side proposed for logging	B1a

STREAMSIDE VALUE Moderate

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently.

No special precautions to protect streamside vegetation are required.

All falling and yarding should be away from the stream.

Remedial measures such as yarding unmerchantable material away from the stream and cleaning out debris should be considered if necessary.

SPECIFIC CONSIDERATIONS	INITIAL STRATEGY
If both sides proposed for logging	A1b
If only one side proposed for logging	B1b

STREAMSIDE VALUE High

GENERAL GUIDELINES

All falling and yarding must be away from the stream.

Deciduous trees and shrubs and non-merchantable conifers should be left along the streamside and protected as much as possible from logging and broadcast burning damage and snag falling.

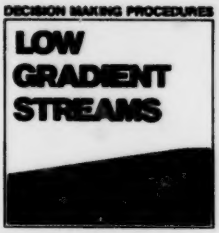
Special efforts should be made to prevent logging debris from entering the stream.

Remedial measures such as yarding unmerchantable material away from the stream or cleaning out logging debris should be considered if necessary.

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
For debris buffering	
If both sides proposed for logging	A2a
If only one side proposed for logging	B2a
For channel and streamside stability	
If both sides proposed for logging	A3b
If only one side proposed for logging	B3b

Streamside management strategies are illustrated on pages 63 to 79.
Strategy modification factors are considered on page 80.

LOW

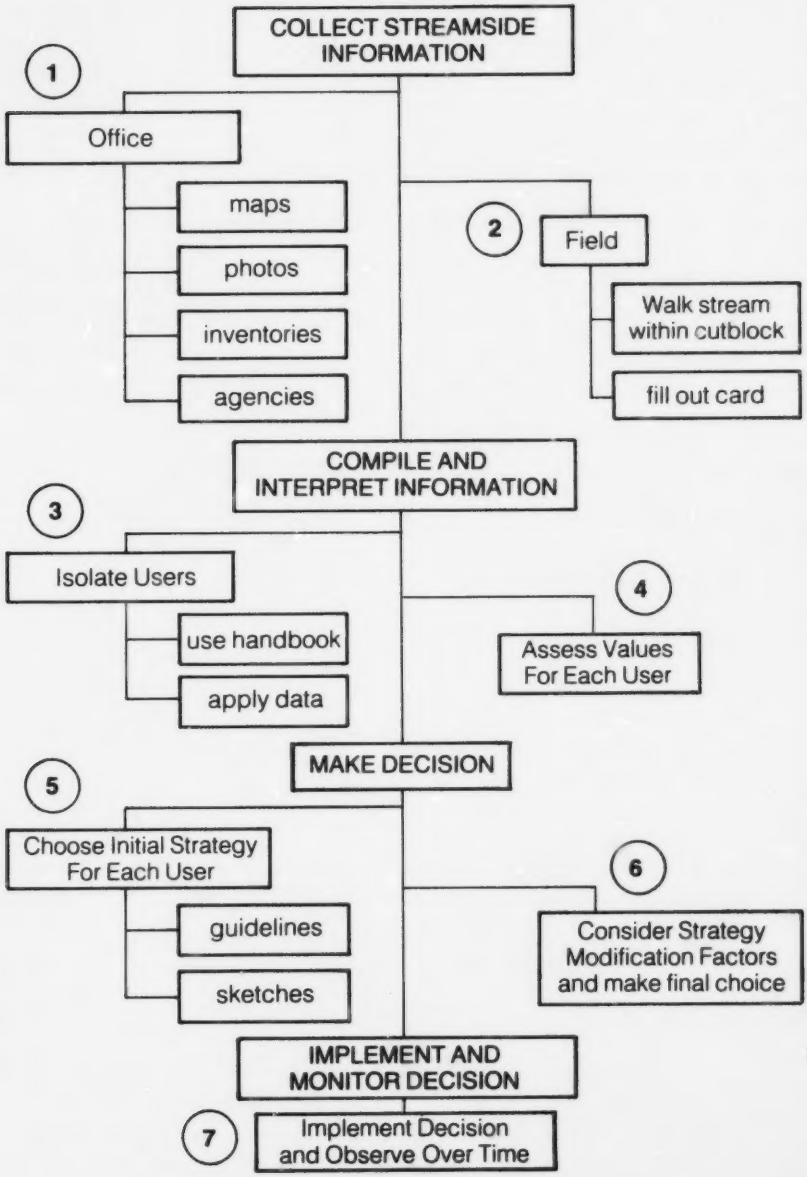


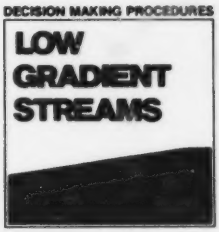
DECISION-MAKING PROCEDURE FOR LOW GRADIENT STREAMS

This procedure should be used for streams with average gradients of less than 20% or which have streamside users present on-site. The impacts of logging the streamside on fish, Roosevelt elk, recreational values, aesthetic values and downstream water users are considered if those users are identified as present on-site or downstream.

If on-site inspection reveals that the average gradient is 20% or greater, and there are no onsite users the procedure for steep gradient streams should be used.

Low Gradient Procedure
FLOWCHART





Prior to visiting the proposed cut block, review available inventory data, development maps, resource capability maps, topographic maps and air photos.

The following items are recommended for review prior to visiting the block proposed for logging. The information may be available from government agencies, resource folios, local knowledge or air photos. If it is available, it can point out specific areas of concern for field checking, and aid in field evaluation of the streamside proposed for logging.

Climatic Information

1. Annual Rainfall
2. Winter Snow Depths
3. Direction of Storm Winds
4. Severity of Storm Winds

Watershed Information

5. Upstream Lakes or Marshes
6. Downstream Lakes or Marshes
7. Extent of Streamside Already Logged
8. Blowdown History
9. Alder and Brush Problems
10. Bank or Slope Failures
11. Debris Jamming

Information on Cutblock

12. Falls or Stream Obstructions
13. Slope Failures
14. Channel Instability or Flood Channels
15. Debris Jams

Streamside Users

16. Fish Species on Site
17. Fish Species Downstream
18. Distance Downstream to Anadromous Fish
19. Roosevelt Elk in Watershed
20. Present Recreational Use
21. Capability for Recreation
22. Recreational Use Downstream
23. Unusual Natural Features
24. Historical or Archeological Values
25. Downstream Domestic Water Users
26. Distance to Downstream Users

Sources of Information for Pre-Site Visitation Review

1-4 Climate and Data Services, Resource Analysis Branch, Ministry of Environment and Atmospheric Environment Services. Also local knowledge and company experience.

5-7 Cruise notes, topographic maps, development maps, air photos.

8-11 Company experience, local Forest District Staff.

12 Stream inventory (Fish and Wildlife Branch), air photos, maps.

13-15 Air photos, development maps.

16-18 Escapement records (Federal Fisheries) or stream inventory (Fish and Wildlife Branch), local knowledge of cruisers, engineers, Federal Fisheries Officers, Conservation Officers.

19 Wildlife Inventory (Fish and Wildlife Branch), local knowledge.

20 Steelhead Society, Rod and Gun clubs, Hiking clubs, Canoe clubs, local knowledge, Conservation Officer.

21 Folio maps, recreational capability classification B.C.F.S., local hiking and fishing clubs as per #20.

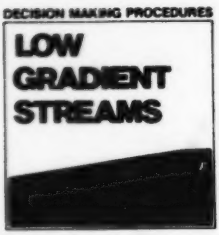
22 Same as #20.

23 Folio maps, local knowledge.

24 Local knowledge, Ministry of Environment.

25 Water Rights Branch.

26 Federal Fisheries Officers, stream inventory (Fish and Wildlife Branch), Conservation Officer.



Walk the length of the stream within the proposed cutblock and complete the Streamside Checklist.

This Checklist, which is reproduced in field card size, should be completed on-site. It is the only part of the procedure that need be taken into the field.

Observations to complete the checklist should be made along the stream edge and up to a distance of 40 metres (2 chains) back from the stream edge depending upon topography. If stream or streamside characteristics, such as gradient, substrate or the slope of the streamside change markedly over the length of the cutblock, two checklists should be filled out. These changes should also be noted on a map.

Upon completion, the Checklist is used in conjunction with this booklet to determine the appropriate streamside management strategy.

Notes for completion of this Checklist are included.

Streamside Checklist (low gradient streams)

1. Stream Name _____
2. Block Identification _____
3. General Location _____
4. Block Location _____
5. Stream Flows _____ 6. Elevation (m) _____
7. Opposite Bank _____
8. Tributary Streams _____

Stream

9. Classification –	Intermittent		Perennial	
10. Average Gradient (%)	<3	3-8	9-20	>20
11. Rooted Width (m)	<1	1-3	4-10	>10
12. Low Flow Discharge (c.f.s.)	<10	10-30	>30	

13. Substrate	Organic	Fines	Pebbles	Cobbles	Boulders	Bedrock
% Composition						

Streamside

14. Slope (%)	Flat	<20	20-45	46-70	>70
% Distribution					

15. Length of Slope (m) <20 20-60 >60

16. Material Texture	Clay	Silt	Sand	Pebbles	Cobbles	Boulders
% Composition						

17. Bedrock – Exposed Shallow Deep
18. Rooting Depth – Shallow Moderate Deep

Streamside Vegetation

19. Tree Species _____

20. Deciduous Trees (per 30 m)	<2	2-5	>5
21. Non-Merch. Trees (per 30 m)	<2	2-5	>5
22. Leaners (per 30 m)	<2	2-5	>5
23. Shrub Cover (%)	<25	25-50	>50

Stream Channel	Yes	No
24. Side Channels		
25. Flood Channels		
26. Old Stream Channels		
27. Undercut Banks		
28. Eroding Banks		
29. Stable Channel		

Slope Stability (If sloping)	Yes	No
30. Evident Slumps		
31. Disturbed Soils		
32. Pistol Butt/ Jackstraw Trees		
33. Heavy Fern Cover		
34. Wet Depressions		
35. Gullying		
36. Visible Clay		

In-Stream Debris	Yes	No
37. Debris Jams		
38. Large Anchored Debris		
39. Large Moving Debris		

Stream Shading	Yes	No
40. Steep Bank or Topog		
41. 50% From Overhang		

Blowdown		
42. Old Blowdown		
43. Hummocky Ground		
44. Root Rot or Conks		
45. Skunk Cabbage		
46. Shallow Rooting		

Comments _____

Stream and Streamside Users

Fish

47. Fish Presence (on site) — Anadromous or Sport Fish Present / Small Resident Fish Present / No Fish Present

48. Basis
- Fish Observed
- Inventory Info
- Escapement Records
- Local Knowledge
- Habitat Evaluation
- Falls/Obstructions
- Other

49. Sensitive Areas Present
- Numerous Stream Channels
- Active Flood Plains
- Several Small Coho Streams
- Side Channels
- Highly Unstable Channel or Banks

50. Comments

If No Anadromous or Sport Fish Present

51. Distance to Fish Water

Roosevelt Elk

52. Elk Presence (on site) — Present / Absent

53. Basis
- Elk Observed
- Pellets Observed
- Tracks/Trails
- Local Knowledge
- Inventory Info
- No Evidence
- Other

If Roosevelt Elk Present

	Yes	No
54. Timber Accessible		
55. Elk Movement in Stream		

Active Recreation

	Yes	No
56. Present Recreational Use		
57. Potential for Recreational Use		
58. High Potential for Recreation		

59. Present Activities

60. Potential Activities

Visual Aesthetics

	Yes	No
61. Distinctive Visual Features		
62. Visible From Primary Travel Route		
63. Close to Recreational Area or Trail		

64. Comments

Water Users

	Yes	No
65. Domestic Water Supply		
66. Downstream Recreation		

If Downstream Recreation or Water Supply

67. Distance

Special Users

68. Nesting Sites

69. Heritage Sites

70. Other

71. Harvesting Considerations

Notes For Streamside Checklist (low gradient streams)

1. **Stream Name**
   Give gazetted name, local name or made-up name for identification
2. **Block Identification**
   Give TFL, TSHL, FL, TSL or other number, CP number and block identification number
3. **General Location**
   Give general location of stream e.g. tributary to, or flows into, or map reference
4. **Block Location**
   Give position of block on stream e.g. west side or both sides. Give road access
5. **Stream Flows**
   Give direction of stream flow at block location e.g. west
6. **Elevation**
   Give the stream elevation at midpoint in the block
7. **Opposite Bank**
   Indicate whether logged, unlogged, firebreak, narrow leave strip, etc. If logged, indicate regeneration
8. **Tributary Streams**
   Indicate number and rooted width of tributary streams entering main stream through cutblock. Indicate whether perennial or intermittent
9. **Classification**
   Circle intermittent or perennial. If stream dries up at any time in year it is intermittent
10. **Average Gradient**
    Use a clinometer to measure average gradient of stream over representative reaches. Circle one average value. If the gradient changes markedly over the length of the cutblock, two checklists should be completed
11. **Rooted Width**
    Circle one width as representative of stream average. Rooted width is the width of the stream channel between rooted vegetation on either bank, estimated where there is only a single channel.
12. **Low Flow Discharge**
    Time a floating chip or twig over representative reach of stream to determine stream velocity in feet/sec. Determine average width and depth of stream. Use the equation
    Discharge = Width x Depth x Velocity
    c.f.s. ft. ft. ft./sec.
    to determine present discharge. From present discharge estimate **low flow discharge** and circle one value. Low flow refers to the lowest flow of the year.
13. **Substrate**
    Indicate percentage composition of the stream bed material e.g., 40% cobbles, 60% boulders or 20%fines, 20% pebbles, 60% cobbles.
    Fines — <2 mm (< .06") in diameter
    Pebbles — 2-64 cm (.06"-3")
    Cobbles — 6.4-25.6 cm (3"-10")
    Boulders — >25.6 cm (>10")
    Bedrock — consolidated rock
14. **Slope**
    Indicate percentage distribution of slopes of the streamside between the vegetation adjacent to the stream and the topographic break (if there is one), e.g. 20% flat, 80% 0-20 slope or 20% 0-20 slope, 20% 20-45 slope, 60% 45-70 slope. Note slope changes on a map.

15. Length of Slope

If sloping, indicate length of slope to the topographic break. Circle one value.

16. Material Texture

Indicate the textural class composition of the streamside surficial materials including the soil and the unconsolidated material below the level of root penetration e.g., 20% sand, 20% silts, 60% pebbles.

Clay — < 004 mm, sticky when moist if rolled between fingers.
Silt — 004- 062 mm, slippery when moist if rolled between fingers.
Sand — 062-2 0 mm, gritty when rolled between fingers.
Pebbles — 2-6 4 cm (.06"-3") in diameter.
Cobbles — 6 4-25 6 cm (3"-10")
Boulders — >25 6 cm (>10")

17. Bedrock

Circle one description to indicate depth to bedrock.
Exposed — if outcrops are visible on streamside.
Shallow — if soil depth is less than 1 metre (39")
Deep — if soil depth is greater than 1 metre

18. Rooting Depth

Circle one description to indicate depth of rooting for roots .5 cm or greater.
Shallow — if roots do not penetrate below 50 cm. (19.5")
Moderate — if roots penetrate between 50 cm - 100 cm
Deep — if roots penetrate greater than 100 cm (39")

19. Tree Species

Indicate mature streamside trees in order of abundance. Include deciduous and coniferous trees within 40 m. (2 chains) of stream edge.

20. Deciduous Trees

Indicate the approximate number of deciduous trees offering shade and cover along the immediate stream-edge. Average over 30 metres (100 feet). Circle one value. Value refers to one side only.

21. Non-Merch. Trees

Indicate the approximate number of non-merchantable coniferous trees offering shade and cover along the immediate stream-edge. Average over 30 metres (100 feet). Circle one value. Value refers to one side only.

22. Leaners

Indicate the approximate number of trees along the streamside which lean over or towards the stream and cannot be felled conventionally without falling into or across the stream. Average over 30 metres (100 feet). Circle one value. Value refers to one side only.

23. Shrub Cover

Indicate percentage of ground covered by shrubs along the immediate stream edge. Do not include saplings or trees. Circle one value. Value refers to one side only.

24. Side Channels

Check YES if present. Side channels are slowly flowing channels, separated from the main channel but connected to it at high flows. They may or may not be connected at low flows.

25. Flood Channels

Check YES if present. Flood channels are channels, separated from the main channel, which carry water only during peak flows and are dry through the rest of the year.

26. Old Stream Channels

Check YES if present. Old stream channels are former main channels of the stream which no longer carry water due to relocation of the main channel.

27. Undercut Banks

Check YES if a significant feature of the site. Include banks which are being actively undercut by the stream.

28. Eroding Banks

Check YES if a significant feature of the site. Include banks which are being eroded by the stream.

29. Stable Channel

Check YES if stream is well defined with a single main channel and no evidence of channel shifting or significant evidence of sloughing within the past year.

30. Evident Slumps

Check YES if a significant feature of the site. Evident slumps refers to clearly visible slope failures on the streamside.

31. Disturbed Soils

Check YES if an obvious feature of the site. Severely disturbed soils have mixed soil horizons indicating movement or slumping of the slope.

32. Pistol-butt/Jackstraw Trees

Check YES if a significant feature of the site. Pistol-butt trees are trees with a sweep or bow in the butt and may indicate slope movement. Jackstraw trees are trees leaning in various directions so that their tops are entangled.

33. Heavy Fern Cover

Check YES if a significant feature of the site. Includes most common fern species except Bracken.

34. Wet Depressions

Check YES if a significant feature of a sloping streamside. Wet depressions refer to wet pockets or depressions on a slope, often with skunk cabbage and black mucky soils.

35. Gullying

Check YES if a significant feature of a sloping streamside. Gullying refers to the presence of numerous dry sharply incised gullies at right angles to the main stream along the streamside.

36. Visible Clay

Check YES if present. Visible clay refers to lenses of clay visible in cut banks or on the streamside.

37. Debris Jams

Check YES if present. Debris jams are accumulations of debris which impede the normal flow of water and serve as a catch for moving debris.

38. Large Anchored Debris

Check YES if present. Large anchored debris is logs or large chunks anchored in place in, or above, the stream and often covered with mosses or algae but not obstructing or diverting the normal flow of water or acting to catch moving large debris.

39. Large Moving Debris

Check YES if present. Large moving debris is logs or large chunks not anchored in place and not covered with mosses or algae which will move downstream during periods of high water.

40. Steep Bank or Topog.

Check YES if stream is in a steep draw or a narrow valley and is shaded by its banks or by local topographic features such as a hill or ridge. It must provide approximately 50% shading or more during the summer.

41. 50% From Overhang

Check YES if the deciduous and non-merchantable trees and shrubs directly overhead shade more than 50% of the stream.

42. Old Blowdown

Check YES if there are numerous blowdown trees on the site.

43. Hummocky Ground

Check YES if a significant feature of the site. Hummocky ground refers to numerous mounds and hollows on flat or gently rolling terrain which give the area a hummocky appearance.

44. Root Rot or Conks
Check YES if a significant feature of the site

45. Skunk Cabbage
Check YES if a significant feature of the site

46. Shallow Rooting
Check YES if stream gravels, hardpans or compacted layers, clay layers or any other factors restrict the normal rooting of trees or lead to a prolonged high water table which creates shallow root systems. This can be observed from the stream edge, or cutbanks or on old blow down trees.

47. Fish Presence
Circle one description which most accurately assesses fish presence **on site.**

48. Basis
Indicate the reason(s) for the description chosen in 47. More than one may be chosen. If other than those listed, specify.

49. Sensitive Areas Present
If any of the following conditions are present on the area, they should be noted and guidance sought from Federal Fisheries or Fish and Wildlife Branch officers — alluvial areas with numerous stream channels, active flood plains, several active side channels, numerous small coho streams, or highly unstable stream channel or banks.

50. Comments
Add any comments pertaining to fish species, populations, use of area (spawning, overwintering, etc.) potential for enhancement and so on.

51. Distance to Fish Water
If no fish are present on site, indicate the distance downstream to water frequented by anadromous or sport fish. If the distance is unknown, indicate.

52. Elk Presence
Circle either present or absent to indicate whether elk are present on site.

53. Basis
Indicate the reason(s) for the description chosen in 52. More than one may be chosen. If other than those listed, specify.

54. Timber Accessible
Check YES if, in addition to the block slated for logging, there is mature timber accessible to the elk for cover in the winter.

55. Elk Movement in Stream
Check YES if stream is of low gradient with fine substrate and low banks so that elk can enter the water and move up and down the stream channel in winter. If the stream has very high steep banks, or wide gravel bars on which snow piles up, or if the stream is fast flowing, elk cannot move in the stream.

56. Present Recreational Use
Check YES if there is any evidence of present recreational use such as fishing trails, old fishing line, campsites, hiking trails, litter, or from local knowledge of recreational use. This does not include hunting.

57. Potential Recreational Use
Check YES if area has potential for recreational use. Consider features such as fish in the stream, presence of water falls, caves or other scenic features of interest to hikers, canoeing potential, campsite locations and so on. Consider also accessibility.

58. High Potential Recreational Use

Check YES if area is considered to have a **high** potential, as opposed to potential. Consider the site features, site accessibility, and regional recreational use.

59. Present Activities

Indicate recreational activities presently taking place on the streamside.

60. Potential Activities

Indicate potential activities which could take place on the streamside. Consider accessibility to recreationists.

61. Distinctive Visual Features

Check YES if stream has distinctive features such as large pools, rapids, waterfalls, canyons, or caves or if streamside has distinctive features such as very large mature trees or an open understory with a diversity of herbs, mosses and ferns. Check YES only if considered distinctive.

62. Visible From Primary Travel Route

Check YES if streamside is visible from a highway or mainline logging road, recreational access road or from a ferry or major boat route.

63. Close to Recreational Area or Trail

Check YES if streamside is close to, or visible from, a recreational area such as a park, campsite, boating or fishing area or if close to a recreational trail. Consider area "close" if potentially used or viewed by recreationists in adjacent recreational area.

64. Comments

Add further comments pertaining to the visual quality of the area or its likelihood of being viewed by the general public.

65. Domestic Water Supply

Check YES if water from the stream, either on-site or downstream, is used as domestic water including a town's main water supply.

66. Downstream Recreation

Check YES if water from the stream is used downstream by recreationists. Include fishing, camping and boating activities in the stream or on a lake or coastal inlet.

67. Distance

If there are downstream users indicate the distance downstream.

68. Nesting Sites

Indicate any eagle or heron nests observed on site or if there are large numbers of snags with holes in them which may be used by cavity nesting birds (woodpeckers, owls, chickadees, mergansers, buffleheads and wood ducks).

69. Heritage Sites

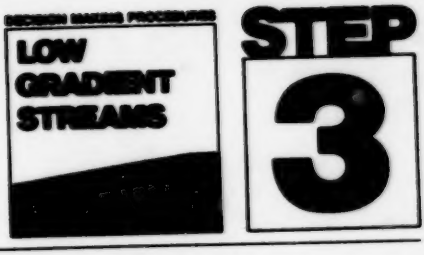
Indicate if the site has any historical, cultural or archeological value such as burial caves, pictographs, petroglyphs, old canoes, cabins or encampments.

70. Other

Indicate any other present or potential non-timber users of the streamside.

71. Harvesting Considerations

Add any comments pertaining to the volume or quality of the stand, decadence, mistletoe, deflection, block layout and so on.



Identify and Isolate the Users of the Streamside

If SENSITIVE SITES are noted (Checklist #49), Initial Choice of Strategy is ..... **A4 or B4 (pages 70 and 78)**

Users of the Streamside

If anadromous fish or large resident sport fish are present on site or potentially present as indicated by on-site inspection, escapement records, stream inventory information or local knowledge
refer to ..... **FISH USER CLASS I (page 36)**

If small resident fish are present on site as indicated by on-site inspection, stream inventory information or local knowledge
refer to ..... **FISH USER CLASS II (page 40)**

If no fish are present on site as indicated by on-site inspection, stream inventory information or local knowledge but are present downstream refer to ..... **FISH USER CLASS III (page 43)**

If Roosevelt Elk are present on site as indicated by on-site inspection, wildlife inventory information or local knowledge
refer to ..... **ROOSEVELT ELK USER (page 46)**

If stream is perennial and if present recreational use or potential for use is observed on the streamside
refer to ..... **ACTIVE RECREATIONAL USER (page 47)**

If stream is perennial and if stream or streamside is distinctive, or is viewed or potentially viewed from a primary travel route, recreational area or trail
refer to ..... **VISUAL AESTHETICS USER (page 48)**

If water from the stream is used as domestic water, or if the stream is tributary to a lake, river or coastal inlet that is used by recreationists or viewed from a primary travel route
refer to ..... **DOWNSTREAM WATER USER (page 49)**

If stream or streamside appears to have special value as a nesting site for birds or other important value to wildlife, or as a historical or archeological site, or any other special value refer to Ministry of Forests, B.C. Fish and Wildlife Branch ..... SPECIAL USERS

For each identified User, assess the Value of the Streamside

Fish User - Class I

If anadromous fish or large resident sport fish are present on site, or if stream has potential to support anadromous or sport fish, consider the value of the streamside vegetation for **each** of the following:

(a) shading the stream (below); and
(b) buffering it from logging debris (page 37); and
(c) stabilizing the channel and streamside (page 38); and
(d) protecting side and flood channels (page 39).

Then consider

(e) the overall streamside value (page 39).

(a) Stream Shading

CONSIDERATION	EVALUATION	SHADING VALUE*
1. Direction stream flows and location of block	If block is on N, NW or NE side of stream If block is on S, SW or SE side of stream, consider 2. If block is on E or W side of stream, consider 3. If logging considered for both sides of stream, consider 2.	Low
2. Local topography	If stream is in a narrow valley or deep draw and well shaded by local topography or steep streambank. If stream is on flat or in a wide valley and not shaded by local topography or steep streambank, consider 3.	Low

CONSIDERATION	EVALUATION	SHADING VALUE*
3. Gradient and discharge of stream	If gradient is greater than 3% or discharge greater than 10 c.f.s. at low flow, consider 4.	
	If gradient is less than 3% and discharge less than 10 c.f.s. at low flow	High
4. Upstream area of stream	If upstream areas are steep or turbulent or well shaded.	Low
	If upstream areas are extensively clear cut or if there are lakes, open marshes or other large unshaded areas.	Moderate

* *Refers to the value of the streamside vegetation for shading the stream.*

(b) Debris Buffering		BUFFERING VALUE**
1. Slope of streamside	If slope of streamside is predominantly less than 20%***	Low
	If slope of streamside is predominantly between 20%- 70%***, consider 2.	
	If slope of streamside is predominantly greater than 70%***	High
2. Size and gradient of stream	If rooted width of stream is less than 3 metres (10 ft.) or gradient less than 3%. If rooted width of stream is greater than 3 metres (10 ft.) and gradient greater than 3%, consider 3.	High
3. Substrate and channel stability	If substrate is predominantly organic, fines or pebbles or if stream channel shows such signs as shifting as old channels, undercut or eroding banks or if there are natural debris jams.	High
	If substrate is predominantly cobbles, boulders or bedrock and if banks are well defined and stable with nc evidence of channel shifting or debris jams.	Moderate

** *Refers to the value of the standing streamside vegetation for preventing logging debris from entering the stream. If the streamside trees were removed some logging debris could enter the stream directly from falling or from downslope movement of debris.*

*** *If the slope of the streamside is highly variable as indicated by the Streamside Checklist, more than one slope class may be used and different stabilizing values obtained. Different management strategies may then be used on the site to reflect the variation in slope.*

(c) Channel and Streamside Stability

CONSIDERATION	EVALUATION	STABILIZING VALUE*
1. Topography	If streamside is predominantly flat, consider 2.	
	If streamside is predominantly sloping**, consider 3.	
2. Channel Stability	If stream channel is well-defined and stable.	Low
	If stream channel is not stable or has signs of old stream channels, undercut or eroding banks.	High
3. Slope	If slope of streamside is predominantly less than 45%**.	Low
	If slope of streamside is predominantly between 45% and 70%** consider 4.	
	If slope of streamside predominantly greater than 70%**.	High
4. Site indicators of slope failure	If signs of old slope failures are evident, i.e., if there are evident slumps or disturbed soils or if there are pistol-butt or jackstrawed trees.	High
	If signs of potential for slope failures are evident, i.e., if there is heavy fern cover, wet depressions or skunk cabbage on slope, gullying or visible layers of clay.	High
	If no evidence of slope failures or potential for slope failures.	Low

* *Refers to the value of the streamside vegetation for maintaining channel and streamside stability.*

** *If the slope of the streamside is highly variable as indicated by the Streamside Checklist, more than one slope class may be used and different stabilizing values obtained. Different management strategies may then be used on the site to reflect the variation in slope.*

(d) Side and Flood Channel Protection **

CONSIDERATION	EVALUATION	PROTECTIVE VALUE*
1. Presence of side or flood channels	If side or flood channels are observed.	High
	If no side or flood channels are observed.	Low

(e) Overall Streamside Value

The value for each of the following functions:

(a) Stream Shading
(b) Debris Buffering
(c) Channel and Streamside Stability
(d) Side and Flood Channel Protection

has been considered.

If one or more values are High, the overall streamside value is High. Make initial choice of strategy on page 52 to 54.

If no value is High but one or more is Moderate, the overall streamside value is Moderate. Make initial choice of strategy on page 51.

If all values are Low, the overall streamside value is Low. Make initial choice of strategy on page 50.

* *Refers to the value of the streamside vegetation for protecting side channels from logging damage and preventing logging debris entering flood channels.*

** *The Side or Flood Channel must be within the streamside otherwise it is not part of the strategy.*

Fish User - Class II

If small resident fish are present on site, but no anadromous or sport fish, consider the value of the streamside both to the on-site resident fish and to possible downstream anadromous fish. Consider the value of the streamside for each of the following:

(a) shading the stream (below); and
(b) buffering it from logging debris (page 41); and
(c) stabilizing the channel and streamside (page 42)

Then consider:

(d) the overall streamside value (page 42).

(a) Stream Shading

CONSIDERATION	EVALUATION	SHADING VALUE*
1. Gradient	If stream gradient is greater than 8%.	Low
	If stream gradient is less than 8%, consider 2.	
2. Discharge and gradient of stream	If low flow discharge is less than 10 c.f.s. and if gradient is less than 3%, consider 3.	
	If low flow discharge is greater than 10 c.f.s. or if gradient is greater than 3%, consider 5.	
3. Location of block	If on N, NW or NE side of stream.	Low
	If not on N, NW or NE side of stream or proposed for both banks, consider 4.	
4. Local topography	If stream is in a narrow valley or deep draw and well-shaded by topography or steep streamside.	Low
	If stream is on flat or in wide valley and not shaded by topography or steep streamside.	High
5. Upstream area	If upstream areas are steep or well-shaded.	Low
	If upstream areas are not steep, and are extensively clearcut or if there are lakes, marshes or other large unshaded areas, consider 6.	
6. Anadromous fish presence and downstream cooling	If anadromous fish downstream but inputs of cooling tributary water, and downstream shading.	Moderate
	If anadromous fish downstream with no inputs of cooling tributary water, or if extensive openings downstream.	High
	If no anadromous fish downstream.	Low

* *Refers to the value of the streamside vegetation for shading the stream.*

(b) Debris Buffering

CONSIDERATION	EVALUATION	BUFFERING VALUE*
1. Slope of streamside	If slope of streamside is predominantly flat or less than 20%**. If slope of streamside is predominantly greater than 20%**, consider 2.	Low
2. Size and gradient of stream	If stream gradient is greater than 3% and rooted width of stream is greater than 3 metres (10 ft.), consider 4.	
	If stream gradient is less than 3% and rooted width of stream is greater than 3 metres (10 ft.).	Moderate
	If rooted width of stream is less than 3 metres (10 ft.), consider 3.	
3. Substrate and channel stability	If substrate is predominantly organics, fines, or pebbles or if stream shows evidence of large moving debris, debris jams, old stream channels or undercut or eroding banks, consider 4.	
	If substrate is predominantly cobbles, boulders or bedrock, with large anchored debris and with a well-defined and stable channel.	Low
4. Anadromous fish presence	If anadromous fish downstream.	High
	If no anadromous fish downstream.	Moderate

* *Refers to the value of the standing streamside vegetation for preventing logging debris from entering the stream. See footnote, page 37.*

** *If the slope of the streamside is highly variable as indicated by the Streamside Checklist, more than one slope class may be used and different buffering values obtained. Different management strategies may then be used on the site to reflect the variation in slope.*

(c) Channel and Streamside Stability

CONSIDERATION	EVALUATION	STABILIZING VALUE*
1. Topography	If streamside is predominantly flat**, consider 2.	
	If streamside is predominantly sloping**, consider 3.	
2. Channel stability	If stream channel is stable.	Low
	If stream channel has signs of old stream channels, undercut or eroding banks.	High
3. Slope	If slope of streamside is predominantly less than 45%**.	Low
	If slope of streamside is predominantly between 45% and 70%**, consider 4.	
	If slope of streamside is predominantly greater than 70%**.	High
4. Site indicators of slope failure	If signs of old slope failures are evident ie. if there are evident slumps or disturbed soils or if there are pistol-butt or jack-strawed trees.	High
	If signs of potential for slope failure are evident i.e. if there is heavy fern cover, wet depressions or skunk cabbage on slope, gullying or visible clay layers.	High
	If no evidence of slope failures or potential for slope failure.	Low

(d) Overall Streamside Value - Class II Streamsides

The value for each of the following functions:

(a) Stream Shading
(b) Debris Buffering
(c) Channel and Streamside Stability has been considered.

If one or more values are High, the overall streamside value is High. Make initial choice of strategy on page 52 to 54.

If no value is High but one or more is Moderate, the overall streamside value is Moderate. Make initial choice of strategy on page 51.

If all values are Low, the overall streamside value is Low. Make initial choice of strategy on page 50.

* *Refers to the value of the streamside vegetation for maintaining channel and streamside stability.*

** *If the slope of the streamside is highly variable, as indicated by the Streamside Checklist, more than one slope class may be used and different stabilizing values obtained. Different management strategies may then be used on the site to reflect the variation in slope.*

Fish User - Class III

If no fish are present on site and the stream has no fisheries potential, consider the value of the streamside vegetation to possible downstream fish. Consider the value of the streamside for preventing both:

(a) the downstream movement of logging debris (below); and

(b) downstream sedimentation from bank failures and channel shifting (page 44).

Then consider:

(c) the overall streamside value (page 45).

(a) Debris Buffering

CONSIDERATION	EVALUATION	BUFFERING VALUE*
1. Slope of streamside	If slope of streamside is predominantly flat or less than 20%**. If slope of streamside is predominantly greater than 20%**, consider 2.	Low
2. Size of stream or channel stability	If rooted width of stream is greater than 3 metres (10 ft.), consider 3. If rooted width of stream is less than 3 metres (10 ft.) with evidence of large moving debris, debris jams or old stream channels, undercut or eroding banks, consider 3.	
	If rooted width of stream is less than 3 metres (10 ft.) with large anchored debris in place and with a stable channel.	Low
3. Proximity to anadromous fish	If close to anadromous fish water.	High
	If distant from anadromous fish water.	Moderate

* *Refers to the value of the standing streamside vegetation for preventing logging debris from entering the stream. See footnote, page 37.*

** *If the slope of the streamside is highly variable as indicated by the Streamside Checklist, more than one slope class may be used and different buffering values obtained. Different management strategies may then be used on the site to reflect the variation in slope.*

(b) Channel and Streamside Stability

CONSIDERATION		STABILIZING VALUE*
1. Size of stream and channel stability	If rooted width of stream is less than 3 metres (10 ft.), with large anchored debris and with a stable channel, consider 2.	
	If rooted width of stream is greater than 3 metres (10 ft.) or if there is evidence of large moving debris, debris jams, old stream channels, or undercut or eroding banks, consider 3.	
2. Proximity to anadromous fish water	If close to or immediately tributary to anadromous fish water, consider 3.	
	If distant from anadromous fish water.	Low
3. Slope of streamside	If slope of streamside is predominantly less than 45%**.	Low
	If slope of streamside is predominantly greater than 45%**, consider 4.	
4. Site indicators of slope failure	If signs of old slope failures are evident i.e. if there are evident slumps, or disturbed soils, or if there are pistol-butt or jackstraw trees.	High
	If signs of potential for slope failures are evident i.e. if there is heavy fern cover, wet depressions or skunk cabbage on slope, gullying or visible clay layers.	High
	If no evidence of slope failures or potential for slope failures.	Low

* *Refers to the value of the streamside for maintaining streamside and channel stability.*

** *If the slope of the streamside is highly variable as indicated by the Streamside Checklist more than one slope class may be used and different stabilizing values obtained. Different management strategies may then be used on the site to reflect the variation in slope.*

(c) Overall Streamside Value

The value for each of the following functions:

(a) Debris Buffering

(b) Channel and Streamside Stability

has been considered.

If one or both values are High, the overall streamside value is High. Make initial choice of strategy on page 52 to 54.

If neither value is High but one or both are Moderate, the overall streamside value is Moderate. Make initial choice of strategy on page 51.

If both values are Low, the overall streamside value is Low. Make initial choice of strategy on page 50.

Roosevelt Elk User

If inventory records, local knowledge or on-site inspection indicate Roosevelt elk are present on site, consider the streamside value to elk.

CONSIDERATION	EVALUATION	STREAMSIDE VALUE*
1. Elevation	If over 500 metres (1500 ft.).	Low
	If below 500 metres (1500 ft.), consider 2.	
2. Winter precipitation	If winter precipitation is predominantly rain, and winter snow depths in open areas do not exceed .65 metres (2 ft.), consider 3.	
	If winter precipitation is predominantly snow and winter snow depths in open areas do exceed .65 metres (2 ft.), consider 4.	
3. Availability of cover	If the opposite bank is unlogged or greened-up and if the stream can be crossed by elk or if timber is accessible nearby.	Low
	If the opposite bank is recently logged to the streamside or not accessible to elk and if no timber is accessible nearby.	Moderate
4. Elk movement in stream	If stream gradient is less than 3% and substrate predominantly fines, pebbles or cobbles and if banks are not high and there are not wide gravel bars to prevent elk entering and leaving stream channel.	Moderate
	If gradient is greater than 3% or substrate predominantly boulders or bedrock or if banks are high or there are wide gravel bars to prevent elk entering and leaving stream channel, consider 5.	
5. Steepness and condition of opposite bank	If opposite bank is unlogged and if stream is not in a steep-sided canyon.	Moderate
	If opposite bank is logged to streamside or if stream is in a steep-sided canyon.	High

Make initial choice of strategy for Roosevelt Elk User on page 55.

* *Refers to the value of the standing streamside vegetation to Roosevelt Elk who use the area.*

Active Recreational User

If the stream is perennial and if present recreational use or potential for use is observed on the stream or streamside, consider the streamside value to active recreationists.*

CONSIDERATION	EVALUATION	STREAMSIDE VALUE**
1. Present and potential use	If stream and streamside have no evidence of present recreational use and no potential for recreational use.	Low
	If stream and streamside have no evidence of present recreational use but have potential for recreational use.	Moderate
	If stream and streamside have no evidence of present recreational use but have high potential for recreational use.	High
	If stream or streamside has evidence of present recreation use and potential for recreational use.	Moderate
	If stream or streamside has evidence of present recreational use and high potential for recreational use.	High

Make initial choice of strategy for Active Recreational User on page 57.

* *Active recreationists include anglers, hikers, campers, canoeists, or others who use the stream or streamside directly in the course of recreational activity.*

** *Refers to the value of the streamside vegetation for protecting the quality of the recreational experience for present and potential recreational users.*

Visual Aesthetics User

If stream is perennial and if stream or streamside is distinctive, or is viewed or potentially viewed from a primary travel route, recreational area or trail, consider the streamside value for visual aesthetics.*

CONSIDERATION	EVALUATION	STREAMSIDE VALUE**
1. Distinctive features and sensitivity	If stream and streamside are not distinctive and if not viewed from a primary travel route, recreational area or trail.	Low
	If stream or streamside is distinctive but is not and will not be visible from a primary travel route, recreational area or trail.	Moderate
	If stream and streamside are not distinctive but are or will be visible from a primary travel route, recreational area or trail.	Moderate
	If stream or streamside is distinctive and if visible or potentially visible from a primary travel route, recreational area or trail.	High

Make initial choice of strategy for Visual Aesthetics User on page 59.

* *Visual aesthetics users are viewers of the streamside from a distance. They do not include those involved in active recreation on the streamside.*

** *Refers to the value of the streamside vegetation for maintaining or enhancing the distinctive aesthetic value of the stream or streamside.*

Downstream Water User

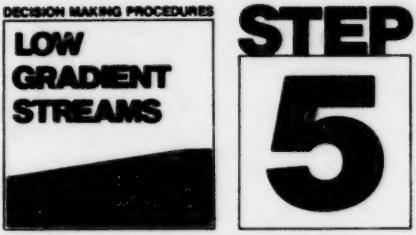
If there are downstream domestic water users or downstream lakes, streams or coastal inlets used by recreationists, consider the streamside value to downstream water users.

CONSIDERATION	EVALUATION	STREAMSIDE VALUE*
1. Size of stream	If rooted width of stream is less than 3 metres (10 ft.) and if site is distant from used areas.	Low
	If rooted width of stream is greater than 3 metres (10 ft.), or if site is close to used areas, consider 2.	
2. Slope of streamside	If streamside is predominantly flat or less than 20%**, consider 3.	
	If slope of streamside is predominantly between 20% and 70%**, consider 4.	
	If slope of streamside is predominantly greater than 70%**.	High
3. Channel stability	If there are old stream channels, undercut or eroding banks, or if there is debris jams or large moving debris present.	High
	If stream channel appears stable.	Low
4. Site indicators of slope failure	If signs of old slope failures are evident i.e. if there are evident slumps or disturbed soils or if there are pistol-butt or jackstrawed trees.	High
	If signs of potential for slope failures are evident i.e. if there is a heavy fern cover, wet depressions or skunk cabbage on slope, gullying or visible clay layers.	High
	If no evidence of slope failures or potential for slope failures.	Moderate

Make initial choice of strategy for Downstream Water User on page 61.

* *Refers to the value of the streamside vegetation for protecting the quality of water for downstream users.*

** *If the slope of the streamside is highly variable as indicated by the Streamside Checklist, more than one slope class may be used and different streamside values obtained. Different management strategies may then be used on the site to reflect the variation in slope.*



Make Initial Choice of Streamside Management Strategy

Choose a strategy, based on the streamside value, for each identified user. If there is more than one user, the strategy requiring the most vegetation is the Initial Streamside Management Strategy.

Fish User

STREAMSIDE VALUE Low

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently.

No special precautions to protect vegetation are required but on Class I and II streams some non-merchantable trees and deciduous vegetation should be left along the stream edge if possible.

On Class I and II streams all falling and yarding must be away from the stream. Special falling techniques such as jacks or cable assist falling should be used if necessary.

On Class I and II streams remedial measures such as removing logging debris from the stream should be considered.

On Class III streams no special falling or yarding techniques or remedial measures are necessary.

SPECIFIC CONSIDERATION	INITIAL STRATEGY
Class I and II streams	
If both sides proposed for logging	A1b
If only one side proposed for logging	B1b
Class III streams	
If both sides proposed for logging	A1a
If only one side proposed for logging	B1a

STREAMSIDE VALUE Moderate for (a) stream shading

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently.

Deciduous trees and shrubs and non-merchantable conifers should be left along the streamside and protected as much as possible from logging and broadcast burning damage and snag falling.

All falling and yarding must be away from the stream.

SPECIFIC CONSIDERATIONS	INITIAL STRATEGY
If both sides proposed for logging	A2a
If only one side proposed for logging	B2a

STREAMSIDE VALUE Moderate for (b) debris buffering

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently.

Deciduous trees and shrubs, non-merchantable conifers and leaners should be left along the streamside and protected as much as possible from logging and broadcast burning damage and snag falling. If special falling techniques such as jacks or cable assist are used, leaners may be removed.

All falling and yarding must be away from the stream.

Remedial measures such as yarding unmerchantable material away from stream and cleaning out debris should be considered if necessary.

SPECIFIC CONSIDERATIONS	INITIAL STRATEGY
If both sides proposed for logging	A2b
If only one side proposed for logging	B2b

Streamside management strategies are illustrated on page 63 to 79.

STREAMSIDE VALUE

High for
(a) stream shading

GENERAL GUIDELINES

Only one side of the stream should be logged at this time. However if substantial vegetation is to be left along the streamside, both sides may be logged.

All deciduous trees and shrubs and immature conifers should be left along the streamside and protected as much as possible from logging and broadcast burning damage and snag falling.

All falling and yarding must be away from the stream.

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
If 50% of original shading can be provided by non-merchantable and deciduous vegetation	B2a
If 50% of original shading cannot be provided by non-merchantable and deciduous vegetation	B2b
The width of the leave strip should be at least equal to the width of the stream but need not exceed 20 metres (1 chain).	

STREAMSIDE VALUE

High for
(b) debris buffering

GENERAL GUIDELINES

Only one side of Class I and II streams should be logged. However if substantial vegetation is to be left along the streamside both sides may be logged. Both sides of Class III streams may be logged.

Vegetation should be left along the stream edge of Class I, II and III streams and should be protected from logging and broadcast burning damage.

All falling and yarding must be away from the stream. Special falling techniques such as jacks or cable assist should be used if leaners are to be removed.

Special efforts should be made to prevent logging debris from entering the stream.

Remedial measures such as yarding unmerchantable material away from the streamside and cleaning out debris should be considered.

High for
(b) debris
buffering

SPECIFIC CONSIDERATION	INITIAL STRATEGY
Class I and II streams	
If slope of streamside is predominantly greater than 70% with a long slope	B3a
If slope of streamside is predominantly greater than 70% with a short slope to a topographic break	B3b
If slope of streamside is predominantly less than 70%	B2b
Class III streams, both sides proposed for logging. If slope of streamside is predominantly greater than 70% with a long steep slope	A3a
If slope of streamside is predominantly greater than 70% with a short slope to a topographic break	A3b
If slope of streamside is predominantly less than 70%	A2b
Class III streams, one side proposed for logging. Same as Class I and II streams.	

The streamside management strategies are illustrated on pages 63 to 79.

STREAMSIDE VALUE

High for
(c) channel and
streamside
stability

GENERAL GUIDELINES

Only one side of Class I and II streams should be logged. However if substantial vegetation is to be left along the streamside both sides may be logged. Both sides of a Class III stream may be logged.

Vegetation should be left on the streamside and should be protected from logging and burning damage and snag falling.

High for
(c) channel and streamside stability

SPECIFIC CONSIDERATIONS — **INITIAL STRATEGY**

If slope of streamside is predominantly greater than 45% with a short slope to topographic break B3b

If slope of streamside is predominantly greater than 45% with a long unbroken slope B4b

If streamside is flat with banks being undercut or eroding B2a

If streamside is flat with unstable channel, evidence of old stream channels or flood channels B4b

The width of the leave strip will depend on the width of the active flood plain.

STREAMSIDE VALUE

High for
(d) side and flood channel protection

GENERAL GUIDELINES

Only one side of the stream should be logged at this time.

Side channels should not be yarded across.

Flood channels may be yarded across at low flow if care is exercised to protect banks and debris is removed. If flood channels are numerous they should not be yarded across.

All vegetation should be left between the side channel(s) and the stream edge.

Vegetation should also be left to protect the side channel and should be protected from logging and burning damage and snag falling.

SPECIFIC CONSIDERATION — **INITIAL STRATEGY**

If there are side channels B4b

If there are numerous flood channels B4b

These strategies apply only to the length of the streamside within the side channel(s) or flood channel(s). For the remainder of the streamside the next appropriate strategy will apply. The width of the leave strip will depend on the distance from the side channel(s) to stream edge.

Streamside management strategies are illustrated on pages 63 to 79.

Roosevelt Elk User

STREAMSIDE VALUE Low

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently.

No special precautions to protect vegetation are required.

No special falling or yarding techniques or remedial measures are necessary.

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
If both sides proposed for logging	A1a
If only one side proposed for logging	B1a

STREAMSIDE VALUE Moderate

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently if other suitable cover is accessible.

Non-merchantable trees and leaners should be left and bank vegetation protected as much as possible from logging and burning damage and snag falling.

Timing should be such that active operation does not coincide with elk movement in the area.

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
If both sides proposed for logging with cover adjacent and numerous alder and non-merchantable trees (more than 5* trees per 30 metres) along stream edge	A2a
If both sides proposed for logging with cover adjacent but very few alder and non-merchantable trees (less than 5* trees per 30 metres) along stream edge	A2b
If one side proposed for logging or if no other cover adjacent and numerous alder and non-merchantable trees (more than 5* trees per 30 metres) along stream edge	B2a
If one side proposed for logging or if no other cover adjacent but very few alder and non-merchantable trees (less than 5* trees per 30 metres) along stream edge	B2b

* Values refer to the total number of deciduous plus non-merchantable trees on one side.

STREAMSIDE VALUE High

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently if suitable cover is accessible.

Mature coniferous trees should be left along the streamside.

Timing should be such that active operation does not coincide with elk movement in the area.

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
If both sides proposed for logging	A4b
If only one side proposed for logging	B4b
The width of the leave strip should be twice the distance from stream edge to elk trails and at least 20 metres (1 chain). If greater than 60 metres (3 chains) and high crown closure	A4a or B4a

The streamside management strategies are illustrated on pages 63 to 79

Active Recreational User

STREAMSIDE VALUE Low

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently

No special precautions to protect streamside vegetation are required

No special falling or yarding techniques or remedial measures are necessary

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
If both sides proposed for logging	A1a
If only one side proposed for logging	B1a

STREAMSIDE VALUE Moderate

GENERAL GUIDELINES

Only one side of the stream should be logged at this time

Falling and yarding must be away from the stream

Deciduous trees and shrubs, non-merchantable conifers, and leaners should be left along the streamside and protected as much as possible from logging and broadcast burning damage and snag falling

Unsafe trees should be removed

Remedial measures such as yarding unmerchantable material away from the stream, clearing debris from the stream and removing slash from trails should be considered

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
If streamside is predominantly flat or gently sloping or a long steep slope with numerous deciduous and non-merchantable trees (more than 5* trees per 30 metres) along the stream edge	B2a
If streamside is predominantly flat or gently sloping or a long steep slope with few deciduous and non-merchantable trees (less than 5* trees per 30 metres) along the stream edge	B2b
If streamside is a short slope to a topographic break	B3b

* Values refer to the total number of deciduous plus non-merchantable trees on one side.

STREAMSIDE VALUE High

GENERAL GUIDELINES

Only one side of the stream should be logged at this time.

Some merchantable conifers, in addition to leaners, non-merchantable and deciduous trees and shrubbery should be left along the streamside and protected from logging and broadcast burning damage and snag falling.

If a wide strip is to be left as a camping area, all unsafe trees and snags should be removed.

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
For fishing, canoeing and hiking activities.	
If streamside is predominantly flat or gently sloping or a long steep slope	B3a
If streamside is a short slope to a topographic break	B3b
If there are hiking or fishing trails, the width of the strip should be twice the distance from the trail to the stream edge.	
For camping activities	
	B4b

The streamside management strategies are illustrated on pages 63 to 79.

Visual Aesthetics User

STREAMSIDE VALUE Low

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently.

No special measures to protect streamside vegetation are required.

No special falling or yarding techniques or remedial measures are required.

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
If both sides proposed for logging	A1a
If only one side proposed for logging	B1a

STREAMSIDE VALUE Moderate

GENERAL GUIDELINES

Only one side of the stream should be logged at this time.

Deciduous trees and non-merchantable trees should be left along the streamside and protected as much as possible from logging and broadcast burning damage and snag falling.

Variety is important. A uniform strip of vegetation should not be left along the entire streamside. The stream should be partially visible to viewers.

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
If stream is distinctive or viewed from a major travel route, recreational area or trail, with numerous deciduous and immature trees (more than 5* trees per 30 metres) along stream edge	B2a
If stream is distinctive or viewed from a major travel route, recreational area or trail with few deciduous and immature trees (less than 5* trees per 30 metres) along stream edge	B2b
If streamside is distinctive	B3a

* Values refer to the total number of deciduous plus non-merchantable trees on one side.

STREAMSIDE VALUE

High

GENERAL GUIDELINES

Only one side of the stream should be logged at this time.

Merchantable trees should be left along the stream edge.

Special measures should be used to protect left trees if any trees are to be removed.

Variety is important. A uniform strip of vegetation should not be left along the entire streamside. The stream should be partially visible to viewers.

SPECIFIC CONSIDERATIONS	**INITIAL STRATEGY**
If stream is distinctive	B2b
If streamside is distinctive	B4b
If width of leave strip is greater than 20 metres (3 chains)	B4a

The streamside management strategies are illustrated on pages 63 to 79

Downstream Water User

STREAMSIDE VALUE Low

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently.

No special precautions to protect vegetation are required.

SPECIFIC CONSIDERATIONS	INITIAL STRATEGY
If both sides proposed for logging	A1a
If only one side proposed for logging	B1a

STREAMSIDE VALUE Moderate

GENERAL GUIDELINES

Both sides of the stream may be logged concurrently.

Falling and yarding must be away from the stream.

All deciduous and non-merchantable vegetation should be left along the streamside and should be protected as much as possible from logging and burning damage and snag falling.

Remedial measures such as yarding unmerchantable material away from the streamside and cleaning out debris should be considered.

SPECIFIC CONSIDERATIONS	INITIAL STRATEGY
If both banks proposed for logging and slope of streamside less than 45%	A2a
If only one side proposed for logging with slope of streamside less than 45%	B2a
If slope of streamside is greater than 45%	B2b

STREAMSIDE VALUE High

GENERAL GUIDELINES

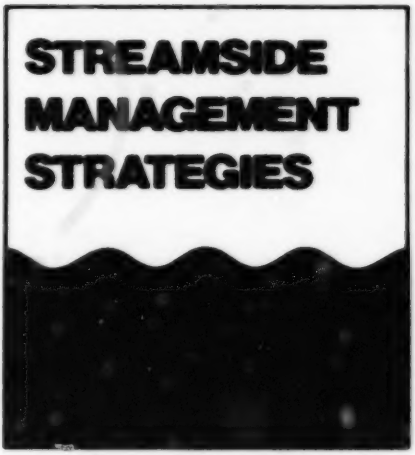
Only one side of the stream should be logged at this time. However, if substantial vegetation is to be left along the streamside, both sides may be logged.

All deciduous and non-merchantable vegetation, and in some cases merchantable conifers, should be left along the stream edge and protected as much as possible from logging and burning damage and snag falling.

Remedial measures such as debris clearances and bank stabilization should be considered.

SPECIFIC CONSIDERATIONS	INITIAL STRATEGY
If stream channel shows signs of instability or if there are debris jams or large moving debris	B3a
If slope of streamside is greater than 70% or if there are signs of old bank failures or potential for bank failure on a short slope to a topographic break	B3b
If slope of streamside is greater than 70% or if there are signs of old bank failures or potential for bank failures on a long slope without a clear topographic break	B4b

The streamside management strategies are illustrated on pages 63 to 79.


STREAMSIDE
MANAGEMENT
STRATEGIES

STREAMSIDE MANAGEMENT STRATEGIES

STRATEGY

A1

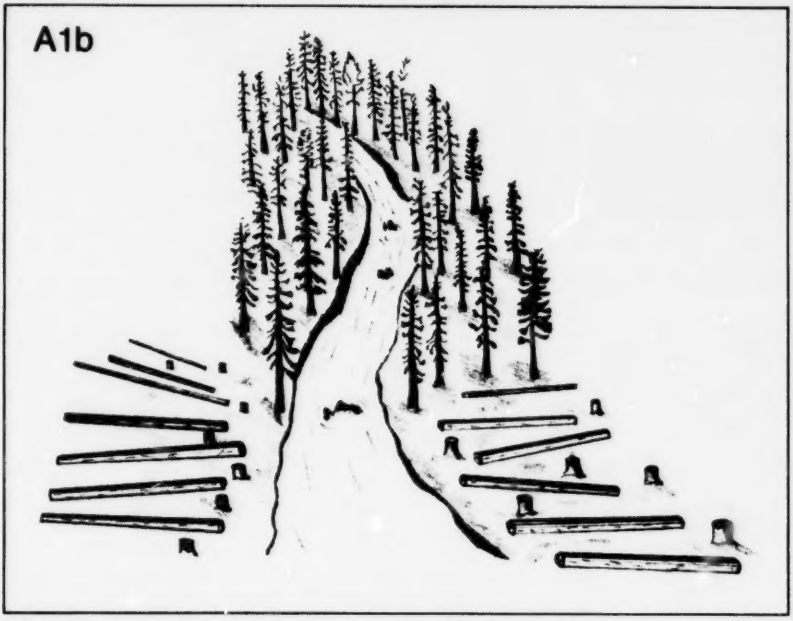
Streamside Management Strategies

These strategies include a range of possibilities for streamside management. Strategies which refer to logging both sides of the stream concurrently are designated as A strategies; those which refer to logging only one side of the stream at this time are designated as B strategies.

A Strategies — **Logging both sides of the stream concurrently.**

Removing all trees to stream edge on both sides of stream concurrently.

(a) falling trees across stream and yarding across stream to landing on one side.



(b) falling trees away from stream and yarding to landings on both sides.

STREAMSIDE MANAGEMENT STRATEGIES

STRATEGY

A2

Streamside Management Strategies

Removing all or most merchantable coniferous trees to stream edge on both sides of stream concurrently, but retaining deciduous trees, non-merchantable conifers and shrubs in a narrow strip along the streamside. Standing snags along the stream edge should also be retained if they do not constitute a safety hazard.

A2a

(a) leaving **no merchantable trees** but retaining all non-merchantable trees and shrubbery.

(b) retaining leaners, and some isolated merchantable trees.

All falling and yarding must be away from the stream. If snags have to be felled, they must be felled away from the stream.

STREAMSIDE MANAGEMENT STRATEGIES

STRATEGY

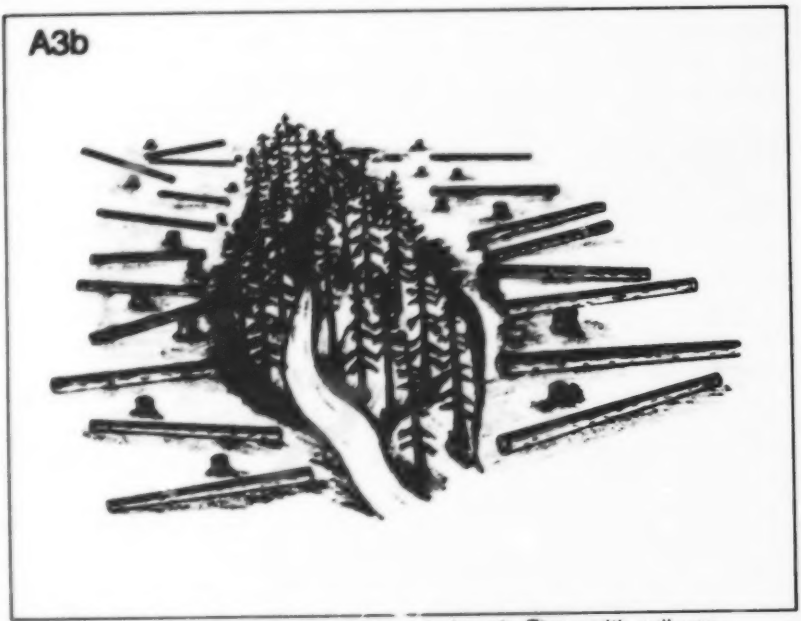
A3

Streamside Management Strategies

Retaining merchantable coniferous trees in a strip along both streamsides.

A3a

(a) of approximately 20 metres (1 chain) in width.



(b) retaining all trees to the topographic break. The width will vary.

STREAMSIDE MANAGEMENT STRATEGIES

STRATEGY

A4

Streamside Management Strategies

Retaining merchantable coniferous trees in a wide strip of up to 100 metres (5 chains) in width along both streamsides.

A4a

(a) removing some conifers by selective logging

A4b

(b) retaining all trees.

The following strategies may be applicable to A4 (a) and (b) for the following sensitive sites.

1. Steep gradient streams with steep banks and unstable soils or evident slumps.
2. Numerous steep gradient streams and gully patterns within the proposed cutblock.
3. Steep gradient streams showing scoured streambanks or evidence of debris torrents.
4. Alluvial areas with numerous active stream channels.
5. Active floodplains, with flood channels, floated debris, or pockets of silt in the streamside zone.
6. Numerous side channels in the streamside zone.
7. Numerous small coho streams within the area proposed for logging.
8. Heavily used recreational areas in old growth timber on major river systems.

If any of these conditions are noted on-site, no logging adjacent to the stream should be considered until representatives of the Ministry of Forests, B.C. Fish and Wildlife Branch and Federal Fisheries have been consulted.

STREAMSIDE MANAGEMENT STRATEGIES

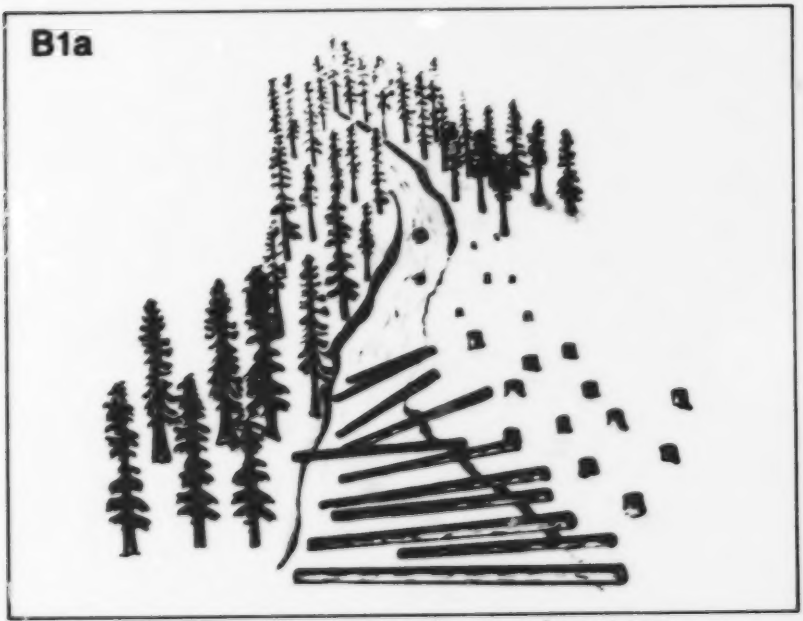
STRATEGY

B1

Streamside Management Strategies

B Strategies Logging on one side of the stream only.
In these cases the opposite streamside is either logged, a leave strip left, not proposed for logging at this time or not recommended for logging at this time.

Removing all trees to stream edge on one side of the stream.



(a) falling trees across stream and yarding away from stream.

(b) falling all trees away from or parallel to stream and yarding away from stream

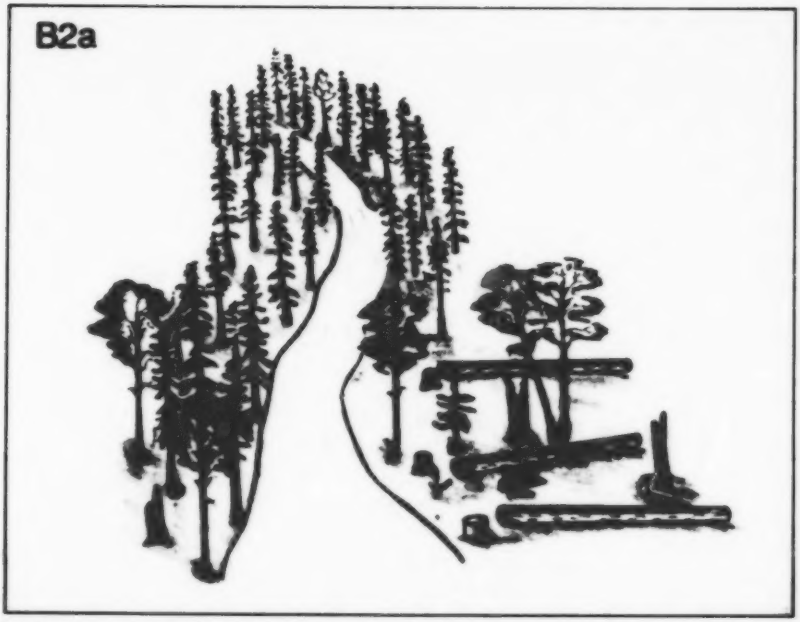
STREAMSIDE MANAGEMENT STRATEGIES

STRATEGY

B2

Streamside Management Strategies

Removing all or most merchantable coniferous trees to stream edge on one side of stream, but retaining deciduous trees, non-merchantable conifers and shrubs in a narrow strip along the streamside. Standing snags should also be retained along the stream edge if they do not constitute a safety hazard.



(a) leaving no merchantable trees but retaining all non-merchantable trees and shrubbery.

(b) retaining leaners, and some isolated merchantable trees

All falling and yarding must be away from the stream
If snags have to be felled they must be felled away from the stream

STREAMSIDE MANAGEMENT STRATEGIES

STRATEGY

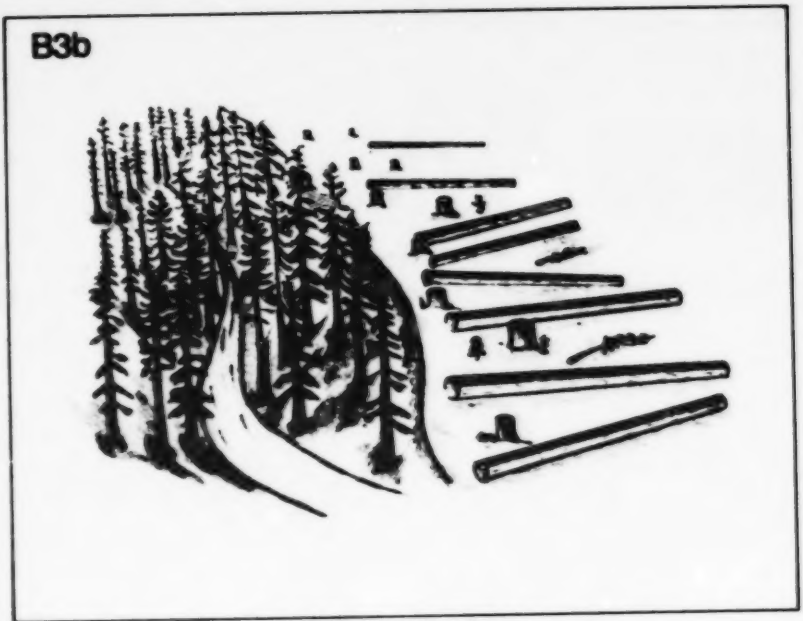
B3

Streamside Management Strategies

Retaining all trees in a narrow strip along the streamside.

B3a

(a) of approximately 20 metres (1 chain) in width.



(b) to the topographic break. The width will vary.

STREAMSIDE MANAGEMENT STRATEGIES

STRATEGY

B4

Streamside Management Strategies

Retaining merchantable coniferous trees in a wide strip of up to 100 metres (5 chains) in width along the streamside.

B4a

(a) removing some conifers by selective logging.

(b) retaining all trees.

These strategies may be applicable for the following sensitive sites:

1. Steep gradient streams with steep banks and unstable soils or evident slumps.
2. Numerous steep gradient streams and gully patterns within the proposed cutblock.
3. Steep gradient streams showing scoured stream banks or evidence of debris torrents.
4. Alluvial areas with numerous active stream channels.
5. Active floodplains, with flood channels, floated debris, or pockets of silt in the streamside zone.
6. Numerous side channels in the streamside zone.
7. Numerous small coho streams within the area proposed for logging.
8. Heavily used recreational areas in old growth timber on major river systems.

If any of these conditions are noted on-site, no logging adacent to the stream should be considered until representatives of the Ministry of Forests, B.C. Fish and Wildlife Branch and Federal Fisheries have been consulted.

Consider Strategy Modification Factors and make final choice of Streamside Management Strategy

The initial strategy indicates the streamside vegetation that should be left to provide for the requirements of the streamside users. However, numerous factors, not previously considered, may have a bearing on the practicality of this strategy. These factors should now be considered and, if necessary, an alternative strategy chosen after consultation with the appropriate resource agencies.

1. Blowdown

Blowdown may reduce the effectiveness of a streamside leave strip and may have a damaging effect on the stream and its users. It is a potentially serious problem on any streamside where an initial strategy choice indicates that merchantable timber should be retained and an assessment of the probability of blowdown should be made for each of these areas. A brief guide to the assessment of the probability of blowdown is provided on pages 82-83.

If there is a high probability of blowdown, alternatives include selecting a windfirm boundary; removing those trees most prone to blowdown using special care in logging; using remedial measures such as debris clearance, rapid replanting, or slope stabilization after logging; falling trees and leaving them if yarding is not possible; or re-orienting the layout of proposed cutblocks. A windfirm boundary should avoid areas of shallow rooting or poor drainage, hummocky relief, nearby topographical features such as humps, knolls and ridges, and should be designed to reduce exposure to storm winds. It should use healthy, windfirm trees as the boundary.

2. Alder Problems

Alder invasion of cut-over areas may be a problem in areas where the initial strategy indicates that alder should be left along the streamside. It is most serious in areas where alder problems have already been experienced, or on west coast, high rainfall sites with thin humus layers and considerable exposed mineral soil.

If alder invasion is felt to be a problem, alternatives include minimizing soil disturbance during logging; removing seed alder but retaining conifers and shrubbery for shading, stability and aesthetics; immediate planting of the site, or acceptance of the potential alder invasion problem.

3. Logging Chance

Such factors as topography, deflection, the number of streams in a block, past logging layout and road location may limit the possible streamside management options.

If the initial strategy is not practical, alternatives include not logging the block; re-orienting the block; using special extractive techniques (cable assist falling, timber jacking, skyline or slackline yarding systems); using special care around the stream during logging; placing seasonal limitations on logging (summer logging along streamside); or using remedial measures after logging (cleaning out logging debris or stabilizing the streamside).

4. Economics

Modification of the initial streamside strategy may be necessary for economic reasons. Removal of timber on the streamside may be justified where timber values exceed the values of other streamside uses. Similarly, a low amount of use or infrequent use may not be sufficient justification to forgo high value timber harvesting. Remedial or amelioration alternatives should be considered where applicable in these situations. Strategy modification for economic reasons should be made on a site specific basis after inspection and consultation by the appropriate managers and resource agencies.

5. Special Harvesting Techniques

Several special falling and yarding techniques may be used along the streamside to remove streamside timber that may be difficult to remove conventionally without damage to the stream or streamside. Cables attached to a tower or to a smaller line horse may be used to aid in directionally falling streamside trees. Timber jacks and hydraulic rams have also been successful in directionally falling trees away from streams. Yarding across a stream may be possible if yarding systems capable of lifting logs clear of the stream are used and no logging debris is allowed to enter the stream.

As new yarding systems are developed they may be applied to specific streamside situations.

Blowdown — Refer to Land Management Report #3 for more detail.

Blowdown results from the interaction of a number of natural factors including location, local topography, climate, aspect and slope, soil depth and texture, tree species and rooting characteristics, and stream characteristics occurring simultaneously. It is also affected by the orientation of the logged opening and the care exercised during and after logging. Because of this complexity, blowdown assessments can only be made relatively, in terms of a low or high probability of blowdown.

Such factors as extensive blowdown in adjacent areas, extensive old blowdown in the area proposed for logging, hummocky ground, extensive root rot or conks, presence of skunk cabbage and wet areas, or shallow rooting of trees caused by stream gravels, compacted layers, cemented layers or clay layers in the surficial materials usually indicate a high probability of blowdown.

Each of the following factors should also be weighed before a decision about the impact of blowdown is made.

The probability of blowdown will be relatively **low** if the proposed leave strip is:

- On the east coast.
- Inland rather than coastal or on a stream flowing into a coastal inlet that opens north, east or west.
- In mountainous terrain.
- Not exposed to winds over long openings, lakes or coastal flats.
- Protected by high ridges, firebreaks or timber on the opposite bank.
- Parallel to the direction of storm winds.
- In an area of low rainfall or with prolonged snow cover in winter.
- At the bottom, or well over the break, of a deep draw or a steeply sloped streamside.
- Deep rooted or on deep well drained soils, shallow to bedrock soils where bedrock is fractured, or medium textured loamy soils where root development is not impeded.
- Predominantly Douglas fir, grand fir, western red cedar, Sitka spruce or deciduous trees.
- An open grown stand where crowns have been exposed to wind.
- Without wet site indicators such as skunk cabbage.
- In a young, healthy stand.

- On a stream with stable streambanks and without bank undercutting.
- In an area where little blowdown has occurred in adjacent leave strips or block perimeters.

The probability of blowdown will be relatively **high** if the proposed leave strip is

- On the west or northeast coast.
- On a coastal inlet opening southeast, south or southwest.
- On coastal flats or steep or narrow valleys which funnel winds.
- Exposed to winds particularly southerly storm winds.
- Downwind of knolls, humps, shoulders, ridgetops or constrictions in valleys which cause winds to increase in speed and become more turbulent.
- At right angles to storm winds or on a bend where a stream turns at right angles to the main valley.
- In an area of high winter rainfall.
- Along the top of a draw or steeply sloped streamside.
- Shallow rooted or on poorly drained soils, shallow to bedrock soils over unfractured bedrock, very fine or very coarse textured soils or any soils where cemented, compacted or clay layers or stream gravels impede rooting.
- Predominantly western hemlock or amabilis fir.
- A dense stand where trees and crowns have not been exposed to winds.
- In wet or marshy areas with pockets of skunk cabbage.
- In a stand with evidence of root rot or other decay.
- On a stream with slumping or undercut streambanks.
- In an area where blowdown has previously occurred in adjacent leave strips or block perimeters or where old blowdown is evident in the stand.

Glossary

Following is a Glossary of Terms as they are used in this booklet. Wherever possible, definitions have been standardized with existing, accepted definitions and those currently in use in British Columbia.

Active Recreationist — Any person, angler, hiker, camper, canoeist or other who uses the stream or streamside directly in the course of a recreational activity.

Aesthetics — Pertaining to the quality of the human perceptual experience (including sight, sound, smell, touch, taste and movement) evoked by phenomena or elements or configurations of elements in the environment.

Alluvial — Pertaining to material that is transported and deposited by running water. Synonymous with **fluvial**.

Anadromous — Having the habit of migrating from more dense to less dense water to breed, generally from oceanic to coastal or from salt water to fresh. Coho, chum, chinook, pink and sockeye salmon, steelhead and sea-run cutthroat trout are examples. See also **resident fish** and **sport fish**.

Anchored Debris — Logs and large chunks of debris, usually natural, which are anchored in place and stable in or above the stream. It is usually covered with mosses or algae and does not obstruct the normal flow of water or catch moving large debris. See also **debris**.

Back Channel — See **channel** and **side channel**.

Blowdown — Uprooted by the wind. Also refers to a tree or trees so uprooted.

Channel — A waterway of perceptible extent which periodically or continuously contains moving water. It has a definite bed and banks which serve to confine the water. See also **flood channel** and **side channel**.

Channel Stability — The relative amount of channel migration caused by cutoffs, diversions and meander development.

Cover — (1) The plants or plant parts, living or dead, on the surface of the ground. (2) The plants (including trees) or other objects used by fish, wildlife or domestic animals for shelter and protection from adverse environmental conditions.

Debris — Debris includes tops, bark, limbs, leaves, needles and finer material as well as logs or trees that accumulate, or might accumulate, in lakes or streams. It occurs naturally or as a consequence of logging operations. **Large debris** includes the undecomposed fragments of tree bole, bark and branches. **Small debris** includes twigs, leaves, needles and finer material. See also **moving debris** and **anchored debris**.

Debris Torrent — The rapid movement of water charged with rock and organic material (debris) down steep stream channels. Debris torrents typically occur in steep intermittent, first and second order channels and are usually triggered by the break-up of debris jams, slides or avalanches entering the channel or collapse of a road fill into a channel.

Discharge — The rate of flow, or volume of water flowing in a given stream at a given place and within a given period of time expressed as cubic feet per second. **Low flow discharge** is the lowest discharge recorded over a specified period of time, usually one year. It usually occurs in late summer or early fall.

Distinctive Visual Features — Refers to those features of landform, vegetative patterns, water forms and rock formations which are of unusual or outstanding visual quality. A **distinctive stream** is one of unusual and or outstanding variety or having uncommon features such as large pools, rapids, waterfalls, canyons or caves. A **distinctive streamside** is one of unusual and or outstanding variety or having uncommon features such as very large mature trees or an open understory with a diversity of herbs, mosses and ferns.

Disturbed Soils — Soils showing obvious mixing of soil horizons and soil disturbance, indicating movement or slumping of the slope.

Domestic Water — Refers to water from any stream which is used as a supply of domestic drinking water or on which there are domestic water rights.

Ephemeral Stream — Refers to flows of water which occur only after precipitation or snowmelt and which do not flow long enough or at large enough volumes to create stream channels.

Flood Channel — A channel connected to the main stream that contains water at high flows.

Flood Plain — Flat land bordering a stream (or river) and subject to flooding, consists primarily of unconsolidated depositioned material derived from sediments being transported by the related stream.

Fluvial — Materials transported and deposited by streams and rivers. Synonymous with **alluvial**.

Fringe Strip — A strip of vegetation which may be of various widths and of various vegetational compositions, which is left adjacent to a stream.

Gradient — The general slope, or rate of change in vertical elevation per unit of horizontal distance, of the water surface of a flowing stream.

Gullying — Refers to the appearance of gully patterns on the bank of a stream but at right angles to the main channel. The gullies may or may not contain water.

Heritage Site — Any site which has identifiable cultural or historical significance of a local, regional or national nature. Such sites include Indian middens, burial caves, old cabins, fish traps, encampments or abandoned settlements, pictographs or petroglyphs.

Hummocky Ground — Relatively flat or gently rolling terrain with numerous small mounds and hollows resulting from the uprooting and decay of many trees and giving the area a hummocky appearance.

Intermittent Stream — A stream which has a defined channel and bed but which dries up for some portion of a year. It flows for longer periods of time than an ephemeral stream and does not dry up immediately after precipitation or snowmelt. See also **ephemeral stream**.

Jackstrawed Trees — Trees leaning in various directions so their tops are entangled.

Leaners — Those trees along the streamside which lean out over the stream and which cannot be felled safely away from the stream with conventional unassisted falling practices.

Merchantable Trees — Those trees which the Crown considers to be marketable.

Moving Debris — Logs and large chunks of debris, either natural or logging, which will move downstream during periods of high water. It is not anchored in place and usually not covered with mosses or algae. See also **debris**.

Non-Merchantable Trees — Those trees which the Crown does not consider to be marketable.

Obstruction — Any object or formation that may impede, block or hinder water flow and/or fish migration.

Perennial Stream — Streams that flow throughout the year.

Pistol Butt Trees — Trees with a sweep or bow in the butt.

Primary Travel Route — Public highways, recreational access roads, mainline logging roads, ferry routes or recreational boating routes on which a primary concern of some of the travelers is scenery.

Recreational Trail — Any trail having evidence of recreational use or known to be used by recreationists (hikers, campers or anglers) or having potential for recreational use.

Resident Fish – Fish that remain in fresh water, non-anadromous. On Vancouver Island, resident fish are usually found in higher gradient, lower productivity streams which provide habitat. See also **anadromous fish** and **sport fish**.

Rooted Width — The width of the stream from rooted vegetation on one bank to rooted vegetation on the other.

Side Channel — A shallow, slowly flowing channel to the side of the main stream channel and separated from it by land and vegetation but connected to the main stream at high flows. It may or may not be connected at low flows. Side channels are synonymous with **back channels** and are usually important fish habitat.

Slope — The degree of deviation of a land surface from the horizontal, usually expressed in per cent (i.e. amount of elevation change per 100 feet expressed as a percentage) or degrees. See also **gradient**.

Slump — Active mass wasting of surficial material from banks or valley walls into stream channels.

Snag — A standing dead tree.

Sport Fish — Fish which are recreationally pursued. On Vancouver Island these include anadromous fish and larger resident fish, often found in lakes, and in streams of lower gradient and higher productivity which are often accessible to a larger stream or a lake. See also **anadromous fish** and **resident fish**.

Stream — Any watercourse which has a flow of water for all or part of the year and which has a defined channel showing signs of scouring or washing.

Streambank — The rising ground bordering a stream channel below the level of rooted vegetation and above the normal streambed.

Streambed — The bottom of the stream below the usual water surface.

Stream-edge — The immediate streamside, where the streambank and the streamside meet. It is usually that part of the streamside where the trees and shrubs providing shade and cover grow.

Stream reach — A length of stream and streamside with fairly uniform characteristics. Changes in a single characteristic can be noted on the checklist.

Streamside — The land, and the vegetation it supports, immediately in contact with the stream or sufficiently close to it to have a major influence on, or to be influenced by, its ecological character.

Streamside Management Zones — Areas along streams, necessary for the protection of the integrity of streams, requiring special management techniques. The size and configuration of each streamside management zone can only be determined by site specific analysis.

Substrate — The material 20-30 cm deep that composes the streambed.

Surficial Materials — Naturally occurring unconsolidated material including soil and non-soil that covers the surface of the earth. **Soil** includes that mineral or organic material that is capable of supporting plant growth. **Non-soil** is that soil-like material which does not support plant growth.

Topographic Break — A distinct change in the slope of the land.

Visual Aesthetics — Pertaining to the visual perceptual experience. See also **aesthetics**.

Visual Aesthetics User — Refers to persons who view the streamside from a distance. Their primary concern is scenery. They do not include those involved in active recreation on the streamside.

With this revised second edition in handbook form, the Ministry of Forests endeavours to better fill the need for an operational decision-making tool for streamside management. Your comments on this decision-making procedure will assist us in making revisions and improvements.

Please forward all comments and suggestions for changes to:

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